SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the relative intensities of the lines obtained in a pure rotational spectrum.

17. What are PQR branches in the electronic spectrum of molecules? Explain the formation of band head, band origin and shading of bands.

18. Explain Raman scattering in detail with respect to pure vibrational and pure rotational Raman spectra of a diatomic molecule.

19. What is the principle behind NMR spectroscopy and also explain the larmor precession.

20. Explain in detail about the Absorption by organic and inorganic molecules using UV-Spectroscopy with suitable examples.

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APRIL/MAY 2025

23PPH42 — SPECTROSCOPY

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Difference between symmetric and asymmetric top molecules.

2. Explain the quadruple moment of linear molecules.

3. Can you distinguish a pair of enatiomers by infra-red spectroscopy?

4. What are the applications of FTIR?

5. Define stokes and antistokes radiation.

6. What is S-branch lines in Raman spectroscopy?

7. Explain the hyperfine structure study of ESR.

8. Which type of nuclei show magnetic properties for the purpose of NMR spectroscopy?

9. When a UV light is passed through a given solution, the radiant power is reduced to 50%, calculate the absorbance.

10. Limitations of Beer-Lambert Law.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Discuss the rotational spectrum of non- rigid rotator.

Or

(b) Discuss the vibrational spectra of linear polyatomic molecules.

12. (a) What type of potential energy curve is obtained for a simple harmonic oscillator and why?

Or

(b) Describe the instrumentation technique of IR Spectrophotometer.

13. (a) State and prove mutual exclusion principle.

Or

(b) Explain in details the enhancement mechanism in SERS.

14. (a) Define relaxation time. Why Fourier Transform technique is employed in nuclear magnetic resonance spectroscopy?

Or

(b) Write a brief note on medical applications of ESR.

15. (a) When an incident beam of wavelength 3000A° is allowed to pass through 2 mm thick pyrex glass, the intensity of radiation was reduced to one tenth of its incident value.What part of the same beam will be transmitted through 1 mm thick same pyrex glass sheet?

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Or

(b) Explain in detail about the application of double beam UV- spectrophotometer.